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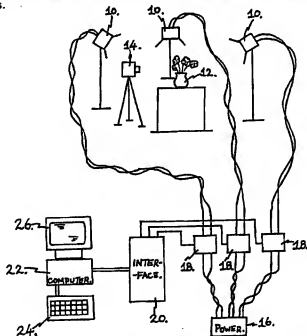
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None

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(54) Controlling photographic exposure

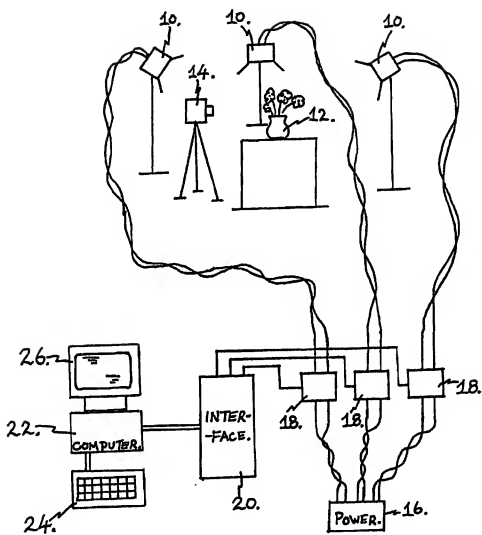
(57) A method of controlling operation of a number of lamps (10) illuminating a subject (12) during a photographic exposure. Before the exposure, the power supplied to each lamp is adjusted by the photographer to give the desired illumination of the subject, and the power input to each lamp is measured and recorded. During the exposure, each lamp is switched on at full power for a time period calculated to produce the same effect on the photographic film as exposing the film to the lamp at the measured power input for the desired exposure time. The time period for each lamp is calculated by making the ratio of the time period to the desired exposure time equal to the ratio of the measured input power to the value of the full power input. Apparatus for carrying out the method includes a computer programmed to carry out the calculation for each lamp. The computer may also be used to control a separate power controller for each lamp to switch the lamps on and off for the calculated time periods. The method and apparatus avoid the problem of colour temperature shift when dimming lamps, particularly tungsten lamps.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1990.



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CONTROLLING PHOTOGRAPHIC EXPOSURE

This invention relates to a method of controlling operation of light sources during exposure of a photographic film.

In taking a photograph of a subject, particularly in the studio, a photographer may use a number of light sources, such as tungsten lamps, arranged at various positions to illuminate the subject simultaneously. In order to control the illumination and lighting balance, the brightness of each lamp may be reduced by using suitable filters in front of the lamp.

It would be more convenient to provide each lamp with a controlled power supply, so that the brightness of each lamp can be directly controlled by controlling the power input to the lamp. The brightness of the lamps could then be adjusted to give the desired illumination of the subject, as judged directly by the eye of the photographer.

This, however, gives rise to a problem, particularly with colour photography, owing to the "colour temperature shift" which occurs in particular with tungsten lamps, is the shift towards the red end of the spectrum of light emitted by the lamp as the power input to the lamp is reduced to dim the lamp. The human eye and brain adjust to this shift, so that a quite significant reddening of the illumination of a subject will not change the perceived colour balance as seen by the eye. The reddening however shows up strongly on colour film. Thus, if the power input to the lamps is adjusted to give the desired illumination as seen by the eye of the photographer, the colour balance in the photograph eventually produced is different.

It is an object of this invention to provide a method and apparatus which avoids this problem.

In accordance with one aspect of this invention, there is provided a method of controlling operation of a number of light sources illuminating a subject during exposure of a photographic film, comprising:

- a. adjusting, prior to the exposure, the power input to each light source to provide a desired illumination of the subject;
- b. measuring the power input to each light source;

- c. during the exposure, switching on each light source at full power for a time period calculated to produce the same effect as exposing the film to the light source at the measured power for a desired total exposure time.

Preferably, the time period for which each lamp is switched during exposure is calculated by making the ratio of the time period to the total exposure time equal to the ratio of the measured input power to the value of the full power input.

In accordance with a further aspect of the invention, there is provided apparatus for controlling operation of a number of light sources illuminating a subject during exposure of a photographic film, comprising:

- a. control means for adjusting the power input to each light source under manual control, whereby a desired illumination of the subject can be obtained;
- b. measuring means for measuring the power input to each light source;
- c. means for calculating, for each light source, from the measured power input, the full power input and a desired total exposure time, a time period for which exposure with the light source at full power will have the same effect as exposure at the measured power for the desired total exposure time; and
- d. means for switching on each light source, during exposure, for the calculated time period.

Preferably, the calculating means comprises a computer.

The invention will now be described, by way of example, with reference to the accompanying drawing, the single figure of which is a diagrammatic representation of apparatus in accordance with the invention.

Referring to the drawing, a number of lamps 10 are used to illuminate a subject 12 to be photographed by a camera 14. Each lamp 10 is connected to a mains power supply 16 through a respective controller 18. Each controller 18 is operable to control the power input to its lamp 10, in dependence upon a control input. The control inputs of the controllers 18 are connected, through a suitable interface 20, to a

computer 22 having a keyboard 24 and a display screen 26. The computer is programmed to control the power input to the lamps 10 in accordance with manual input to the computer through the keyboard 24 or other input device, such as a "mouse". The control input to each controller 18 also provides a measure of the power supply to the associated lamp 10. The computer is also programmed to control the switching on and off the lamps 10 during exposure, as described below.

In use, the photographer adjusts the brightness of each lamp 10, to give a desired illumination of the subject 12. The input power to each lamp is stored in the computer. The photographer inputs into the computer the desired exposure time. The computer calculates, for each lamp, the ratio of the measured power input to the full power input, and multiplies the desired exposure time by this ratio to calculate the time period for which the lamp is to be switched on during exposure. Subsequently, during the exposing step, the computer operates the controller 18 to switch all the lamps simultaneously, and to switch each lamp off after its calculated time period. The lamps are operated at full power during the exposure. The photographic film is therefore exposed in the light from each lamp at full power for a period which gives the same effect as if the lamp had been left on for the full exposure time at the reduced power set by the photographer during the initial adjustment. The photograph obtained after processing the exposed film therefore corresponds accurately to the subject as seen by the photographer.

The switching sequence calculated by the computer can be stored on any suitable storage medium, for example a computer disc. Particular useful sequences can be stored and used to control subsequent exposures without the need to carry out again the process of adjusting the brightness of the lamps. The computer may be programmed to alter the on-periods of the lamps, so as to increase or decrease the overall exposure in response to an input from the photographer, for example to produce a deliberate over-exposure or under-exposure.

The controllers 18 could be operated by the computer, in response to inputs to the computer through the keyboard or other input device. Alternatively, manually controlled dimmers could be used. The measured input power to each lamp could be monitored directly by the computer, as described above, or could be input manually into the computer. The computer could also be programmed, for example to position lamps, reflectors, filters and other components provided with suitable servo-mechanisms in accordance with predetermined instructions.

The method of the invention could be applied to other forms of lighting which are subject to colour temperature shift.

CLAIMS:

1. A method of controlling operation of a number of light sources illuminating a subject during exposure of a photographic film, comprising:
 - a. adjusting, prior to the exposure, the power input to each light source to provide a desired illumination of the subject;
 - b. measuring the power input to each light source;
 - c. during the exposure, switching on each light source at full power for a time period calculated to produce the same effect as exposing the film to the light source at the measured power for a desired total exposure time.
2. A method as claimed in Claim 1, in which the time period for which each lamp is switched on during exposure is calculated by making the ratio of the time period to the total exposure time equal to the ratio of the measured input power to the value of the full power input.
3. A method as claimed in Claim 1 or Claim 2, in which, during the exposure, the light sources are switched on simultaneously, and each light source is switched off after its calculated time period.
4. Apparatus for controlling operation of a number of light sources illuminating a subject during exposure of a photographic film, comprising:
 - a. control means for adjusting the power input to each light source under manual control, whereby a desired illumination of the subject can be obtained;
 - b. measuring means for measuring the power input to each light source;
 - c. means for calculating, for each light source, from the measured power input, the full power input and a desired total exposure time, a time period for which exposure with the light source at full power will have the same effect as exposure at the measured power for the desired total exposure time; and

- d. means for switching on each light source, during exposure, for the calculated time period.
5. Apparatus as claimed in Claim 4, in which the calculating means comprises a computer.
6. Apparatus as claimed in Claim 5, in which the computer is programmed to calculate the time period for which each light source is switched on during the exposure by making the ratio of the time period to the total exposure time equal to the ratio of the measured input power to the value of the full power input.
7. Apparatus as claimed in Claim 5 or Claim 6, further comprising a respective controller for each light source adapted to control the power input to the light source in response to a control input, the computer being programmed to provide the control inputs.
8. Apparatus as claimed in Claim 7, in which the control input to each controller also provides the measure of the power input to the associated light source.
9. Apparatus as claimed in any one of Claims 4 to 8, in which the light sources are tungsten lamps.
10. A method of controlling operation of a number of light sources illuminating a subject during photographic exposure, substantially as described.
11. Apparatus for controlling the operation of a number of light sources illuminating a subject during photographic exposure, substantially as described with reference to, and as shown in, the accompanying drawing.

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Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields

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(ii) Int CL (Edition 5) H05B 39/04, 39/08
G05D 25/02
G03B 15/02, 15/03, 15/035

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Search Examiner

P MARCHANT

Date of Search

8 MAY 1992

Documents considered relevant following a search in respect of claims

1-11

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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